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EQUATOR-SAR MISSION: A COST EFFECTIVE ACTIVE REMOTE SENSING MISSION FOR DEVELOPING NATIONS

Abstract

The Equatorial Region is characterized by dense cloud cover and severe adverse weather conditions. Acquisition of satellite imagery for various purposes and application areas such as agricultural mapping, urban planning, border security, disaster monitoring and mitigation and topographical mapping could prove difficult under such atmospheric conditions when utilizing an optical imaging sensor onboard a space borne platform. It is trend for most Earth observation satellites to be positioned in the near-Polar orbit owing the benefits of global imaging. However, the potentials of utilizing an optical sensor for acquisition of data for the benefit of equatorial nations are yet to be fully realized. An existing limitation of an optical sensor for Earth observation manifests itself in the inability to provide satellite imagery in the absence of favourable lightning and weather conditions. Furthermore, from an orbital geometry perspective, the daily access time to ground station is restricted to an average of four passes. It becomes apparent that alternative solutions necessary to circumvent the limitations of optical remote sensing instruments for the benefit of the ER must be explored. This paper discusses a constellation of S-band SAR satellites in a near-equatorial orbit for the acquisition of regular and timely satellite imagery at the service of equatorial nations. It starts by identifying the economic state of sovereign countries within and around the Equator. It then establishes a potential relationship between the economic state of the identified sovereign states and their levels space capabilities. A definition of the latitude extent of the Equatorial Region is provided viz-a-viz a reclassification by latitude, of sovereign states. A technical description of the Equator-SAR spacecraft is provided. The baseline orbital parameters for the constellation of Equator-SAR mission are then discussed. The required baseline distance for supporting interferometric operation is derived and used as the driver for positioning the satellites within the formation. The results of the analysis conducted for Equator SAR formation flying configuration, using astrodynamics methods and techniques for the determination of its relative stability is shown